CALIFORNIA STATE TEACHERS' RETIREMENT BOARD

INVESTMENT COMMITTEE

SUBJECT: Fixed Income – Performance Benchmark Review ITEM NUMBER: 9

ATTACHMENT(S): 2

ACTION: _____ DATE OF MEETING: March 3, 1999

INFORMATION: X PRESENTER(S): Ms. Cunningham
PCA, Mr. Emkin

EXECUTIVE SUMMARY

According to CalSTRS' asset allocation policy, with a market value of approximately $26 billion as of December 31, 1998, the domestic fixed income asset class constitutes the second largest proportion of the total investment portfolio's assets. Given this significant position in the portfolio, periodic review of this asset class's performance is warranted. As a result, one of the 1998-99 objectives for the Investment Branch is to review the characteristics of an effective performance benchmark and evaluate the validity of the benchmark currently being used within fixed income.

Attachment 1 provides background on the role of fixed income within a multi-asset class portfolio and reviews the issues to consider when selecting a benchmark. Fixed income assets play several important roles within the CalSTRS investment portfolio. These roles include providing diversification, a real rate of return, and cash flow/liquidity. In addition, given the critical nature of benchmark selection, there are key issues to be aware of when considering specific fixed income benchmarks. These key issues include the risk tolerance of the investor, specific guidelines for the fixed income asset class, the level of industry acceptance of the benchmark, and its risk/reward profile.

Attachment 2 reviews the use of CalSTRS' current performance benchmark for the domestic fixed income assets: the Salomon Brothers' Large Pension Fund Index (LPF Index). The LPF Index was originally introduced in 1986 and was designed primarily for pension funds seeking to establish domestic long-term core fixed income portfolios that more closely match the longer duration of their nominal dollar liabilities. In addition to the longer duration, the LPF Index also emphasizes higher yielding securities through a seven-year minimum maturity and a fixed re-weighting of the sectors to overweight corporate and mortgage-backed securities relative to U.S. Treasuries. Given its design criteria, in 1987 the Investment Committee selected the LPF Index as the performance benchmark.

CalSTRS has used the LPF Index as a performance benchmark for its domestic long-term core holdings in fixed income for the past eleven years. The LPF Index has performed as expected: the duration has remained fairly constant and the returns (both nominal and on a risk-adjusted basis) have been higher than other widely used domestic fixed income indices. The analysis shows that, given that CalSTRS' fixed income portfolio has averaged $16 billion over the past ten years, the net benefit of using the LPF Index as the performance benchmark has added more than $160 million annually. In addition, when comparing CalSTRS' returns with those of the LPF Index over the past one, three and five year periods, CalSTRS' outperformance has contributed another $100 million annually.

In conclusion, given the financial impact the decision regarding the performance benchmark can have, it is appropriate to periodically review and evaluate the selection. The original needs of the System, as determined in 1987 by the Investment Committee, are still valid requiring a long duration performance benchmark. Furthermore, the analysis has shown that the LPF Index has performed as expected with better risk-return characteristics than other popular domestic fixed income indices. Therefore, the LPF Index can still be considered an appropriate performance benchmark for CalSTRS' domestic long-term core fixed income assets. However, it should be brought to the Investment Committee periodically for review.

California State Teachers' Retirement System
Fixed Income Portfolio Benchmark Analysis

INTRODUCTION:

CalSTRS' asset allocation policy weighting to fixed income assets (bonds) constitutes the second largest proportion of the total investment portfolio's assets. The significant role of this asset class in the portfolio requires that the Investment Committee periodically review this asset class's performance benchmark.

One of the Investment Office's 1998-99 Investment Objectives is a review of CalSTRS' fixed income benchmark(s). This report provides background on the role of fixed income within a multi-asset class portfolio and reviews the issues to consider when selecting a benchmark.

ROLE OF FIXED INCOME

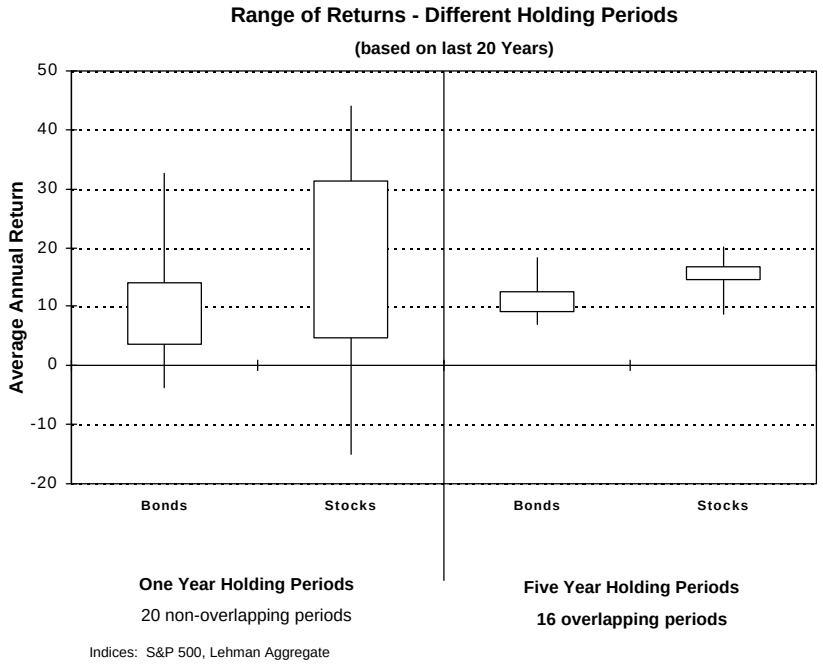
As of December 31, 1998, the CalSTRS investment portfolio held approximately $26.1 billion in non-cash fixed income assets. This amount represented 27.9% of total portfolio assets and was the second largest asset class, second only to domestic equities. (Domestic equities totaled 44.8% of total portfolio assets.)

Fixed income assets play several important roles within the CalSTRS investment portfolio. These roles are:

- *Diversify the risks associated with other asset classes, most specifically publicly-traded equity.*

  Exposure to fixed-income assets should lower the volatility of an equity-only portfolio. In fact, including bonds in a portfolio limited to cash and equities will enhance its risk-adjusted returns (using conventional methods).

  One form of diversification that bonds provide is principal protection over short periods (see chart below).



The boxes on the left show that over any one-year period, stock returns can range from over 40% to less than negative 15%. Bonds, on the hand, have much less expected downside variability. The boxes on the right show that the range of returns for both asset classes is much less over longer time horizons.

- *Provide a real rate of return*

  Bonds should provide some return above the rate of inflation, particularly in environments of declining interest rates. Over a long time horizon, the expected real rate of return of bonds, however, should prove significantly lower than that of equities.

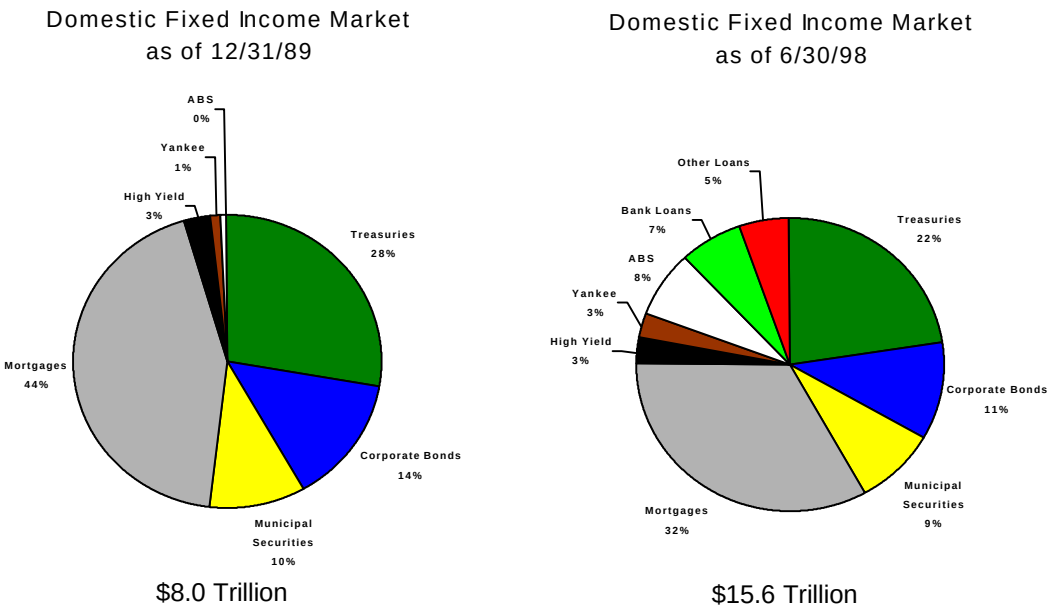
- *Provides cash flow and liquidity*

  Bonds were originally designed as instruments to provide investors with consistent streams of income over varying lengths of time. Over time bonds have evolved to contain other structures, but they still remain the instrument of choice for providing income to investors while reducing the risk of sacrificing invested principal. In an institutional fund such as CalSTRS, significant amounts of income originating from the bond portion of investment portfolio can be redirected and designed to pay plan benefits without selling principal out of the other asset classes. In this respect, bonds play an important liquidity role within a portfolio that, otherwise, has a long investment horizon.

EVOLUTION OF FIXED INCOME MARKETS

Given the above uses for fixed-income, institutional investors have viewed fixed-income assets as a critical component of their portfolios for several decades. As investors interests have evolved, so have the fixed-income markets (see chart below).

Fixed Income Market Trends



Sources: PCA, Lehman, Frank Russell, Credit Suisse First Boston

In the mid-and-late-1980's, publicly traded fixed income opportunities had four major groupings: government bonds (or U.S. Treasuries), mortgage-backed securities, corporate bonds, and municipal bonds (left pie chart). Over the last ten years, the bond market has continued to evolve. Today, many of the minor bond segments of ten-to-fifteen years ago are now playing a much larger role (right pie chart). All of the proportions of the four major segments have declined, giving ground to the newer, more innovative segments. For example, asset-back instruments ("ABS") have grown from virtually no representation 10 years ago to over 8% of the total bond market today. Such is the case with other bond categories such as bank loans and "other" loans.

Such extension of the bond market makes establishing bond policy, portfolio management, and monitoring all the more critical. Given the fundamental roles of fixed-income instruments within a multi-asset class portfolio, the consideration of exposure to these newer instruments and benchmark selection become important facets as CalSTRS continues to consider its overall approach to fixed-income investment.

ISSUES TO CONSIDER WHEN SELECTING A BENCHMARK

Given that benchmark selection is critical in the asset allocation and performance measurement aspects of investment management, one should be aware of key issues that are important when considering specific fixed income benchmarks. In summary, these issues are:

- *The risk tolerance of the investor;*

  An important consideration for CalSTRS is the degree to which principal loss is accepted within the fixed income portfolio. A strong leaning toward principal protection will lead to favoring certain indices over others. For example, longer duration benchmarks will lose more value than intermediate or short duration ones in an inflationary environment.

- *Specific guidelines and role for the fixed income asset class;*

  Closely related to the first issue is the explicit role (or priority of roles) the fixed income portfolio may be required fulfill within the broader overall portfolio. If the priority of the fixed income portfolio is to provide liquidity and/or an income stream to pay plan benefits, then the benchmark should emphasize higher coupons and yields. Such an emphasis will lead to the selection of a benchmark that contains longer maturity securities, since such securities tend to have higher yields than their shorter-maturity counterparts.

- *The underlying representation of the benchmark and its level of industry acceptance;*

  There is significant potential to customize a fixed income benchmark to match an investor's purposes. For example, some institutional investor maintain and utilize very long maturity benchmarks to "match" the plan's benefit payment streams associated with their long-term liabilities. Customization, however, can have its drawbacks. Such customized indices may contain less-than-liquid securities and/or may not be accepted by a wide spectrum of investors. Broadly accepted benchmarks typically contain highly liquid securities representing a wide universe of various fixed income opportunities. Such indices, however, may not match completely the necessary role an investor desires the fixed income asset to have in the overall portfolio.

- *The risk/reward profile of the benchmark;*

  Investors can choose from several fixed-income benchmarks, each have different risk and return attributes. Typically, the more intermediate maturity benchmarks have exhibited the highest risk-adjusted returns. However, as stated in the other bullet points, intermediate benchmarks may not reflect the desired attributes that an investor has for its particular fixed income portfolio. In addition, the return-risk pattern of a specific benchmark is not as critical as how a specific fixed income benchmark impacts the expected risk-adjusted return of the broader overall portfolio.

Attachment 2
Investment Committee – Item 9
March 3, 1999

California State Teachers' Retirement System
Fixed Income Portfolio Benchmark Analysis

BACKGROUND:

The Large Pension Fund Index (LPF Index) was originally introduced in 1986 by Salomon Brothers and was designed primarily for pension funds seeking to establish domestic long-term core fixed income portfolios that more closely match the longer duration[1] of their nominal dollar liabilities. In addition to the longer duration, the LPF Index also emphasizes higher yielding securities through a seven-year minimum maturity and a fixed re-weighting of the sectors to overweight corporate and mortgage-backed securities relative to U.S. Treasuries. By definition, a long-term core holding of investment grade securities does not require the liquidity associated with a full capitalization-weighted market percentage of U.S. Treasuries. Furthermore, the quality enhancement that would come from a market-weighted representation in Treasuries would create a significant return drag over long time periods.

The following table illustrates the criteria used in designing the structure of the LPF:

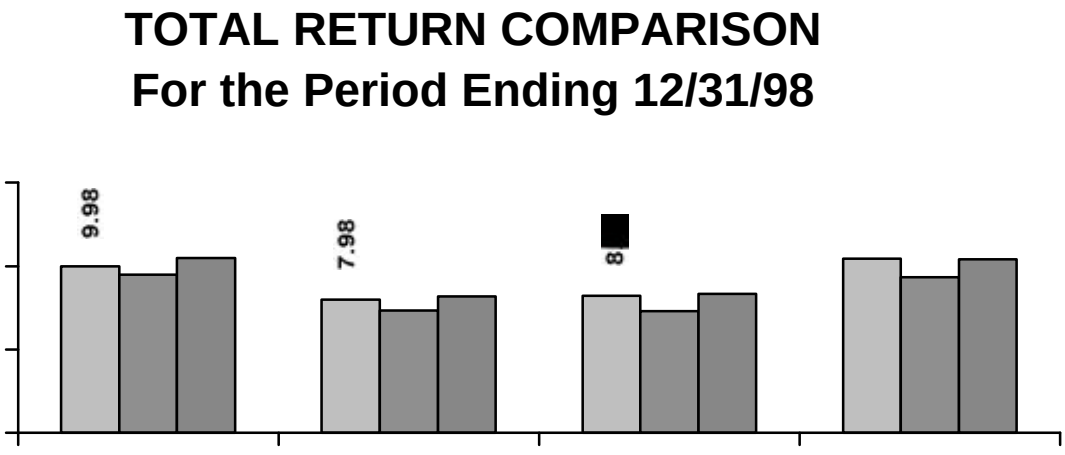
LPF Design Criteria	
Stated Coupon	Fixed Rate
Minimum Maturity	Non-Mortgages: Seven Years Mortgages: One Year
Fixed Weighting	Treasury/Govt. Spons.: 40% Corporate: 30% Mortgage: 30%
Minimum Amt. O/S	Corporates/Govt. Spons.: $100 mm
Composition	Treasury (exc. Infl. Indexed) Agency Supranationals Corporates Yankees and Globals Mortgage pass-throughs
Minimum Quality	BBB-/Baa3 by either S&P or Moody's

[1] Duration is a measure of price sensitivity to interest rates. Duration is the percentage move in price that is anticipated given a 100 basis point (1 percent) move in interest rates.

BENCHMARK ANALYSIS:

In 1987, the California State Teachers' Retirement System (CalSTRS, System) incorporated its preference for a benchmark that is consistent with its long duration liabilities. The Investment Committee selected the LPF Index as the performance benchmark for the domestic long-term core fixed income assets. As described earlier, the LPF Index utilizes fixed sector weightings of 40% U.S. Treasuries/Government Sponsored, 30% Corporates, and 30% Mortgages. This departure from the market capitalization weights of 47% U.S. Treasuries, 23% Corporates, and 30% Mortgages[2], combined with the minimum maturity of seven years for all Treasury/Government Sponsored and corporate securities, provides a less liquid, longer duration benchmark with a higher yield.

For comparison purposes, included in the chart below is a snapshot of the return history for the Salomon Brothers LPF Index (LPF) and the Lehman Brothers Govt./Corp Index (Leh.G/C), which is considered to be an industry standard among the thousands of investment grade fixed income benchmarks. The time periods selected are the past one, three, five and ten year returns for the period ending December 31, 1998. Also included for comparison purposes, is the return for the CalSTRS Fixed Income portfolio over the same time periods.



Throughout the ten-year period studied, the LPF Index has provided a higher total return than the Lehman Govt./Corp. Index, ranging from fifty basis points over the past year to over one hundred basis points for the past ten years. To put this into perspective, given that CalSTRS' fixed income portfolio has averaged $16 billion over the past ten years,

[2] Salomon Brothers BIG Index December 1998

the net benefit of using the LPF Index as the performance benchmark has added more than $160 million annually.

Taking this one step further, when comparing CalSTRS' returns with those of the LPF Index over the past one, three and five year periods, CalSTRS' outperformance has contributed approximately $100 million annually. This can be attributed to the enhanced indexed strategy that CalSTRS follows when managing the fixed income portfolio, in which a tactical approach is taken in selecting securities for the portfolio as compared to owning the target benchmark. This is done in an effort to enhance returns by either reducing risk and/or minimizing transaction costs.

Performance, however, cannot be measured only by looking at relative returns. Return must be related to the amount of risk taken. The Sharpe Ratio relates the excess return (portfolio return less the risk free rate) over the period to the standard deviation of returns over that same period. The following table takes the returns illustrated in the previous chart along with the standard deviation, and translates them into the resulting Sharpe Ratio.

For the Period Ending December 31, 1998

	LPF Index	**Lehman G/C**	**CalSTRS**
1Yr. Total Return	9.98%	9.47%	10.48%
Standard Deviation	1.10	0.98	1.16
Sharpe Ratio	**4.21**	**4.20**	**4.42**
3Yr. Total Return	7.98%	7.33%	8.18%
Standard Deviation	1.53	1.18	1.62
Sharpe Ratio	**1.69**	**1.64**	**1.72**
5Yr. Total Return	8.23%	7.30%	8.33%
Standard Deviation	1.72	1.30	1.77
Sharpe Ratio	**1.70**	**1.53**	**1.71**
10Yr. Total Return	10.45%	9.34%	10.42%
Standard Deviation	1.61	1.27	1.69
Sharpe Ratio	**2.93**	**2.84**	**2.78**

The analysis shows that, over the past ten years, the LPF Index has provided a consistently higher Sharpe Ratio, and therefore a higher risk-adjusted total return, as compared to the Lehman Brothers Govt./Corp. Index. As a result, the selection of the LPF Index as a performance benchmark for CalSTRS has translated into higher risk-adjusted returns for the System. When the analysis is expanded to include CalSTRS' portfolio over the one, three and five year time period, the results indicate that CalSTRS has outperformed the LPF Index on a risk-adjusted basis as well.

LOOKING FORWARD:

CalSTRS has used the LPF Index as a performance benchmark for its domestic long-term core holdings in fixed income for the past eleven years. As described earlier, the LPF Index has performed as expected: the duration has remained fairly constant and the returns have been higher than other widely used domestic fixed income indices. Looking forward, there are considerations associated with the continued use of the LPF Index for the Investment Committee to take into account, including:

1. **Continuity** – Continued use of the LPF Index as a performance benchmark for the domestic long-term core holdings in fixed income will provide continuity for management purposes. CalSTRS has all of the documentation associated with the development of the LPF Index dating back to its origination in 1986.

2. **Desirable Design Criteria** – The LPF Index has been designed to provide a higher yield and longer duration than most other widely accepted multi-sector domestic fixed income indices, which is consistent with the preference for matching the longer liabilities associated with pension funds. Furthermore, the LPF Index is well defined and easily replicable, which are critical characteristics for an effective performance benchmark.

3. **Fixed Income Market Trends** – Over the past decade, the fixed income marketplace has evolved substantially, taking on a more global presence and a number of new structures. Many of the minor bond segments of ten-to-fifteen years ago are now playing a much larger role, thus reducing the role of the traditional U.S. Treasury, Corporate and Mortgage-Backed Security asset classes. <u>As a result, consideration should be given with respect to how to integrate these changes into the fixed income portfolio.</u>

In conclusion, given the financial impact the decision regarding the performance benchmark can have, it is appropriate to periodically review and evaluate the selection. The original needs of the System, as determined in 1987 by the Investment Committee, are still valid requiring a long duration performance benchmark. Furthermore, the analysis has shown that the LPF Index has performed as expected with better risk-return characteristics than other popular domestic fixed income indices. Therefore, the LPF Index is still an appropriate performance benchmark for CalSTRS' domestic long-term core fixed income assets. However, it should be brought back to the Investment Committee periodically for review.